1-1-2016

Effects of Chemical Preservatives on Weights and Lengths of Bluegill Larvae

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ABSTRACT

Measuring the lengths and weights of live fish larvae can be tedious and time-consuming. This constraint could be alleviated by preserving the fish larvae in appropriate chemicals for later measurements. There is little or no information on the effects of preservatives on Bluegill larvae. The objective of this study was to determine the effects of five different common preservatives on weights and lengths of Bluegill larvae. Individual weights and lengths of fish were measured and then the larvae were preserved for 7 or 26 days. Preservatives were 5% formalin, 10% formalin, 30% ethanol at -19 °C, 70% ethanol and 90% ethanol. Preliminary average weights of the larvae preserved for 7d were 1.63, 1.30, 4.02, -0.63, and -4.15g in 5% formalin, 10% formalin, 30% ethanol at -19 °C, 70% ethanol and 90% ethanol, respectively. The average weights for 26d preservations were 2.80, 2.17, 2.38, -0.13, and -4.15g in 5% formalin, 10% formalin, 30% ethanol at -19 °C, 70% ethanol and 90% ethanol respectively. The average lengths of the larvae preserved for 7d were -0.19, 0.08, 0.37, -0.03, and 0.32 in 5% formalin, 10% formalin, 30% ethanol at -19 °C, 70% ethanol and 90% ethanol, respectively. The average lengths for 26d were -0.63, -0.39, -0.12, -0.03, and 0.22 in 5% formalin, 10% formalin, 30% ethanol at -19 °C, 70% ethanol and 90% ethanol, respectively. This study indicated that 70% ethanol had the least effect on weights and lengths of Bluegill larvae preserved for 7 and 26d.

KEY WORDS: Fish, bluegill, larvae, preservatives.

INTRODUCTION

Weighing and measuring fish larvae can be a very tedious and time consuming process. In order to obtain accurate data, it is best to measure the larvae freshly from the water. There are times when a high volume of data must be recorded at one sitting in order to obtain desired information. This can be challenging to complete if large sets of data are to be taken at once, unless the fish can be measured at a later date, such as during a lag time. Preserving fish larvae in appropriate chemical solutions could provide this opportunity.

Two of the common laboratory preservatives are formalin and alcohol. Formalin can be a common choice to preserve fish specimens, however decalcification takes place. Ethanol may be a more desired preservative to avoid this decalcification concern.

Among fish species, results vary for length changes between formalin or alcohol preservation. In comparison with alcohol, formalin caused more shrinkage in winter flounder larvae (Hjörleifsson and Klein-Macphee, 1992) and juvenile sockeye salmon (Shields and Carlson, 1996). Alcohol preservation caused more shrinkage in walleye juveniles (Glenn and Mathias, 1987), capelin larvae (Kruse and Dalley, 1990), and silver hake larvae (Fowler and Smith, 1983) than in formalin.

Concentration of the preservative is an important factor to take into account in using chemical preservatives. In myctophoid fish larvae Mokuet al. (2004) found 70% isopropyl alcohol caused the greatest amount of shrinkage followed by 90 and 70% ethanol; and no significant difference in formalin solutions. Tucker et al. (1984) found that 4% freshwater neutral buffer formalin caused the least amount of shrinkage on southern flounder fish larvae. Comparing 10, 20, 30, 40, and 70% ethanol solutions of both freshwater and saltwater, Gagliano et al. (2006) found that tropical fish can be preserved with the least changes in 30% freshwater ethanol solution at -19° C.

With such varying data between preservatives, species, and concentrations, it is not possible to use data from other studies to preserve Bluegill and obtain accurate measurements at a later date. Little or no information is available on Bluegill preservation. A study found that Bluegill preserved in formalin solutions had slight effects on length but significant increases in weight (Yeh and Hodson, 1975). There have not been any studies done on the preservation of Bluegill larvae. The objective of this study was to determine the effects of five different common preservatives on weights and lengths of Bluegill larvae.

METHODS

•Preservation treatments were 5% Neutral Buffer Formalin, 10% Neutral Buffer Formalin, 30% Ethanol, 70% Ethanol, and 90% Ethanol. The 30% ethanol samples were stored at -19° C. All other samples were stored at room temperature.

•The two preservative treatment times were 7 and 26d.

•Ten fresh Bluegill fish larvae (2 weeks old) from the same spawn were obtained from the Lincoln University Aquaculture Center and used for each preservative treatment (10 fish X 5 treatments = 50 larvae).

•Larvae were individually identified, weighed, and length-measured. Fresh individual larvae weights and lengths were measured before being placed in preservatives. Fresh lengths were taken before weights. Measurements were taken a second time at the end of preservative treatment time.

•For fresh and preserved weights, fluid on the larvae's body was quickly dried on Kimwipes and then placed in a sealed, tared container with water to prevent evaporation weight loss.

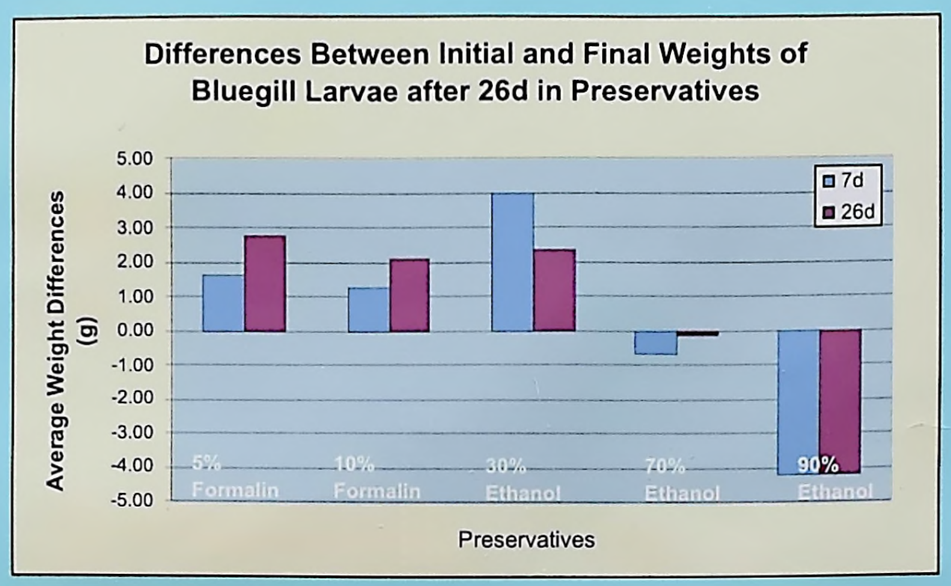
•The larvae were weighed to the nearest 0.1 mg and length was measured to the nearest 0.01 mm using digital calipers while viewing larvae below a stethoscope. Length measurements were taken from the very end of the tail to the mouth.

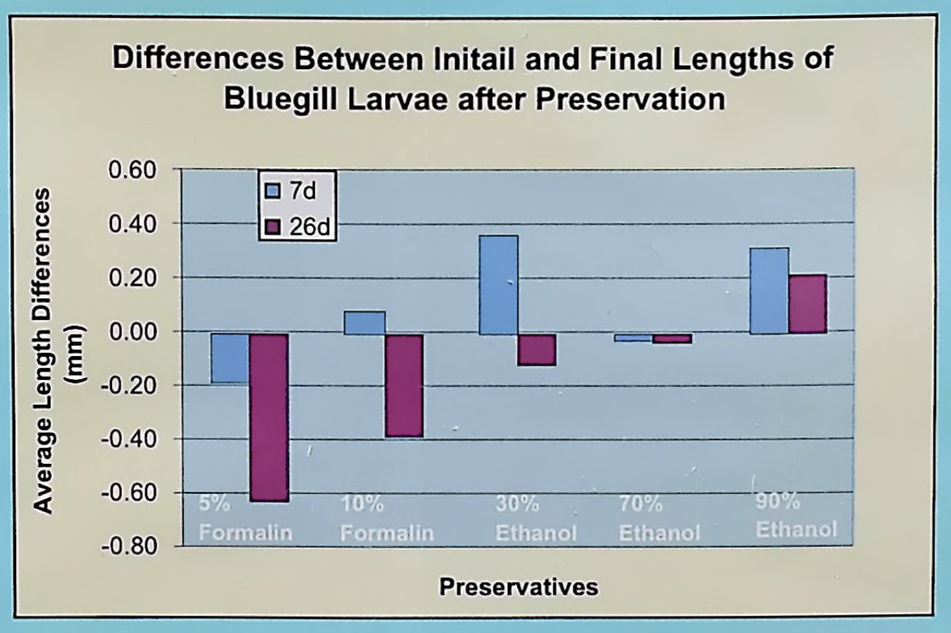
• After measuring fresh weight and length, the larvae were individually placed in marked 9 mL plastic vials containing 7 mL of the respective preservative solutions.

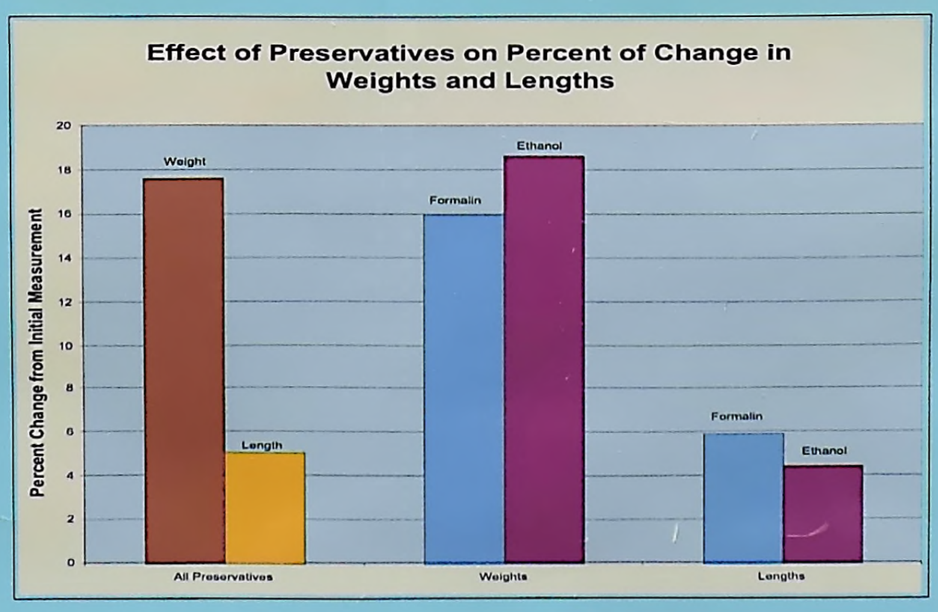
•After 7 days of preservation, one group of larvae weights and lengths were taken and recorded. Weights were taken first, and then lengths.

•After 26 of preservation, the second group of larvae weights and lengths were taken using the same process as in the 7d group.

RESULTS







RESULTS AND DISCUSSION

The results of this study were different from prior preservation studies done with other fish species. They showed length gains for 90% ethanol and also slight differences in formalin treatments. Gagliano et al. (2006) found that for tropical fish larvae 30% ethanol at -19° C storage was preferred. This study, however, showed 30% ethanol under the same condition caused considerable weight changes. In comparison with adult Bluegill preservation, results agreed with Yeh and Hodson (1975) in that formalin solutions caused slight changes to length and significant changes to weight. Length was slightly affected by preservative solutions with the highest average difference being -0.63 mm from fresh lengths. Weights changed significantly ranging from an average of -4.15 mg to 4.02 mg.

Results showed that 70% ethanol had the least effect on weights and lengths. In all treatments the average percent change was 17.6% in weights and 5.04% in lengths. The average percent weight difference was 16.0% for formalin and 18.6% for ethanol treatments. The average percent length difference was 5.9% for formalin and 4.46% for ethanol treatments. In both 7 and 26d treatments, each preservative showed either a consistent weight gain or loss. In contrast, length gains or losses were not consistent.

In the 26d treatments, larvae in ethanol solutions had stayed straight while many larvae in the formalin solutions had curled. The curled larvae had to be straightened for accurate measurement.

Formalin and ethanol had different effects on the larvae. Preserved larvae in formalin retained their natural color and were soft in tissue. On the other hand, preserved larvae in ethanol were pale and stiff.

Weights of the preserved fish had to be taken before lengths to avoid possible damage during length measurement. After obtaining the preserved weights and lengths, the fish were discarded.

CONCLUSION

Chemical preservation affected Bluegill larvae weights more significantly than lengths. Formalin affected the average percent difference of weights less than ethanol. Formalin affected the average percent difference of lengths more than ethanol. The 70% ethanol solution had the least effect on the weights and lengths of the Bluegill larvae preserved for 7 and 26d. There is a need to repeat this study with a larger number of fish in order to confirm the preliminary data of this study.

AKNOWLEDGEMENTS

This project was supported in part by the USDA/CSREES Evans-Allen Agricultural Research Project. Bluegill fish were provided by the Lincoln University Aquaculture Research Center.

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